Quantification of Fugitive Pollutant Sources Using Optical Remote Sensing

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Fugitive air pollutant emissions from area sources such as industrial plants, agricultural operations, and waste facilities are becoming an increasingly important environmental issue. Due to the spatial extent and nonhomogenous nature of these sources, quantification of the total pollutant emission using traditional point sampling and dispersion modeling techniques can be problematic. The ability to directly measure the pollutant emission flux from fugitive sources is highly desirable.

EPA's Atmospheric Pollution Prevention and Control Division (APPCD) is working to develop and standardize a ground-based optical remote sensing method that will meet this important measurement need. The method employs open-path Fourier transform infrared and tunable diode laser spectroscopy to obtain path-integrated pollutant concentration information along multiple plane-configured optical paths. The multi-path pollutant concentration data, along with wind speed and direction information, are processed with a computational algorithm to yield a mass emission flux profile for the source. Control of systems and computations is highly automated, allowing for generation of real-time flux emission information.

APPCD is partnering with the USDA, land-grant universities, and the agricultural industry to perform assessments of pollutant emissions from concentrated animal feeding operations. This technology is also being used to evaluate fugitive emissions from landfills. Through the Measurement and Monitoring Technologies for the 21st Century ($21M^2$) initiative, EPA's Office of Solid Waste and Emergency Response is providing assistance to Region 8 and Region 1 in the evaluation of brownfield and superfund landfills being considered for recreational use or nearby development. APPCD is also participating in a cooperative research and development agreement with Waste Management, Inc. to evaluate fugitive emissions from bioreactor landfills. This technology is playing an instrumental role in determination of fugitive pollutant emissions from different types of bioreactor landfills (e.g., anaerobic, hybrid, and aerobic). APPCD is also working with the Office of Homeland Security in the evaluation of this novel optical remote-sensing technology.

The optical remote-sensing fugitive emission measurement technique yields valuable emission characterization information for input to Office of Air Quality Planning and Standards models and in the development of emission factors. Emission measurement results are also instrumental to industrial partners as a technology evaluation diagnostic.

This presentation provides an overview of the measurement method through example applications, including bioreactor landfill and animal waste lagoon spraying operation assessments.